

What is claimed is:

1. A modified sarcosine oxidase with improved stability in the acidic range compared to a wild-type sarcosine oxidase.
- 5 2. The modified sarcosine oxidase according to claim 1 having a residual activity of 90% or more after 5 hours of heat treatment at pH 6.0, 25°C, and 70% or more after 17 hours of heat treatment at pH 6.0, 25°C.
3. The modified sarcosine oxidase according to claim 2 wherein an activity against  
10 sarcosine in the acidic range is improved compared to a wild-type sarcosine oxidase.
4. The modified sarcosine oxidase according to claim 3 with a  $K_m$  value of less than 6 mM against sarcosine at pH 6.5.
- 15 5. A modified sarcosine oxidase having the following physicochemical properties:
  - (a) action: hydrolyze 1 mol of sarcosine to produce 1 mol of glycine and 1 mol of formaldehyde;
  - (b) optimal pH: around 6.5;
  - (c) stable pH range: between 6.0 and 11.0;
  - 20 (d) optimal temperature: 60°C;
  - (e) thermostability: around 50°C (pH 7.5);
  - (f) stability at pH 6.0: 90% or more of residual activity at 25°C, pH 6.0, 5 hours; 70% or more at 25°C, 17 hours;
  - (g) molecular weight: approximately 43,000 (SDS-PAGE); and
  - 25 (h)  $K_m$  value: 5.9 mM against sarcosine (pH 6.5).
6. A modified sarcosine oxidase of the following (a), (b), or (c):
  - (a) protein composed of the amino acid sequence represented by SEQ ID NO: 1;

(b) protein composed of an amino acid sequence wherein one or some amino acid(s) are deleted, substituted, or added from the amino acid sequence represented by SEQ ID NO: 1, and which has sarcosine oxidase activity; or

5 (c) protein composed of amino acid sequence which shows 80% or more homology to the amino acid sequence represented by SEQ ID NO: 1, and which has sarcosine oxidase activity.

7. Sarcosine oxidase genes encoding modified sarcosine oxidases of the following (a), (b), or (c):

10 (a) protein composed of the amino acid sequence represented by SEQ ID NO: 1;

(b) protein composed of an amino acid sequence wherein one or some amino acid(s) are deleted, substituted, or added from the amino acid sequence represented by SEQ ID NO: 1, and which have sarcosine oxidase activity; or

15 (c) protein composed of an amino acid sequence which shows 80% or more homology to the amino acid sequence represented by SEQ ID NO: 1, and which has sarcosine oxidase activity.

8. A recombinant DNA characterized in that the sarcosine oxidase gene according to claim 7 is inserted into a vector DNA.

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9. A transformant or transductant comprising the recombinant DNA according to claim 8.

10. A method for preparing a modified sarcosine oxidase characterized by culturing the transformant or transductant according to claim 9 in a medium, and collecting a sarcosine  
25 oxidase from the culture.